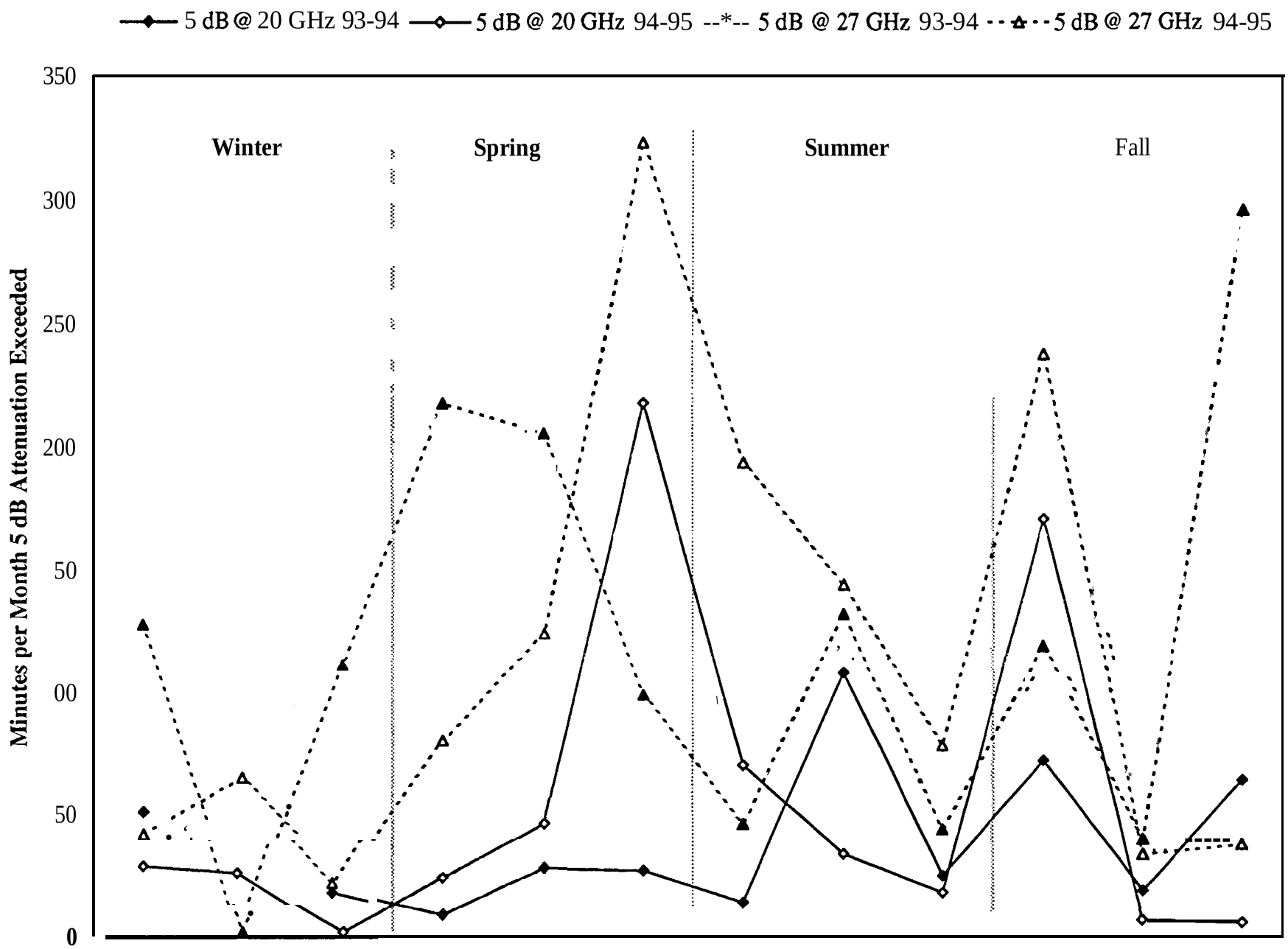
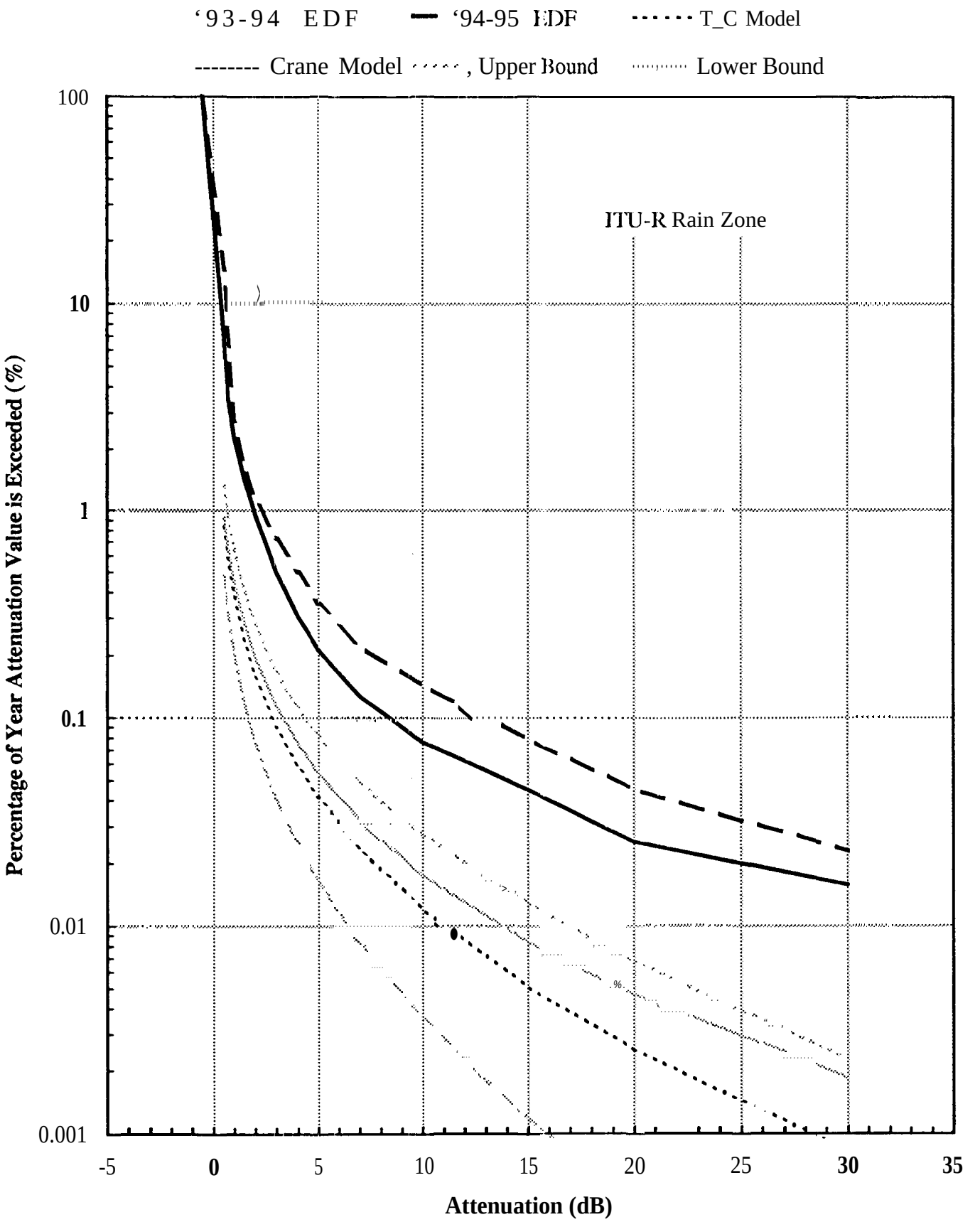
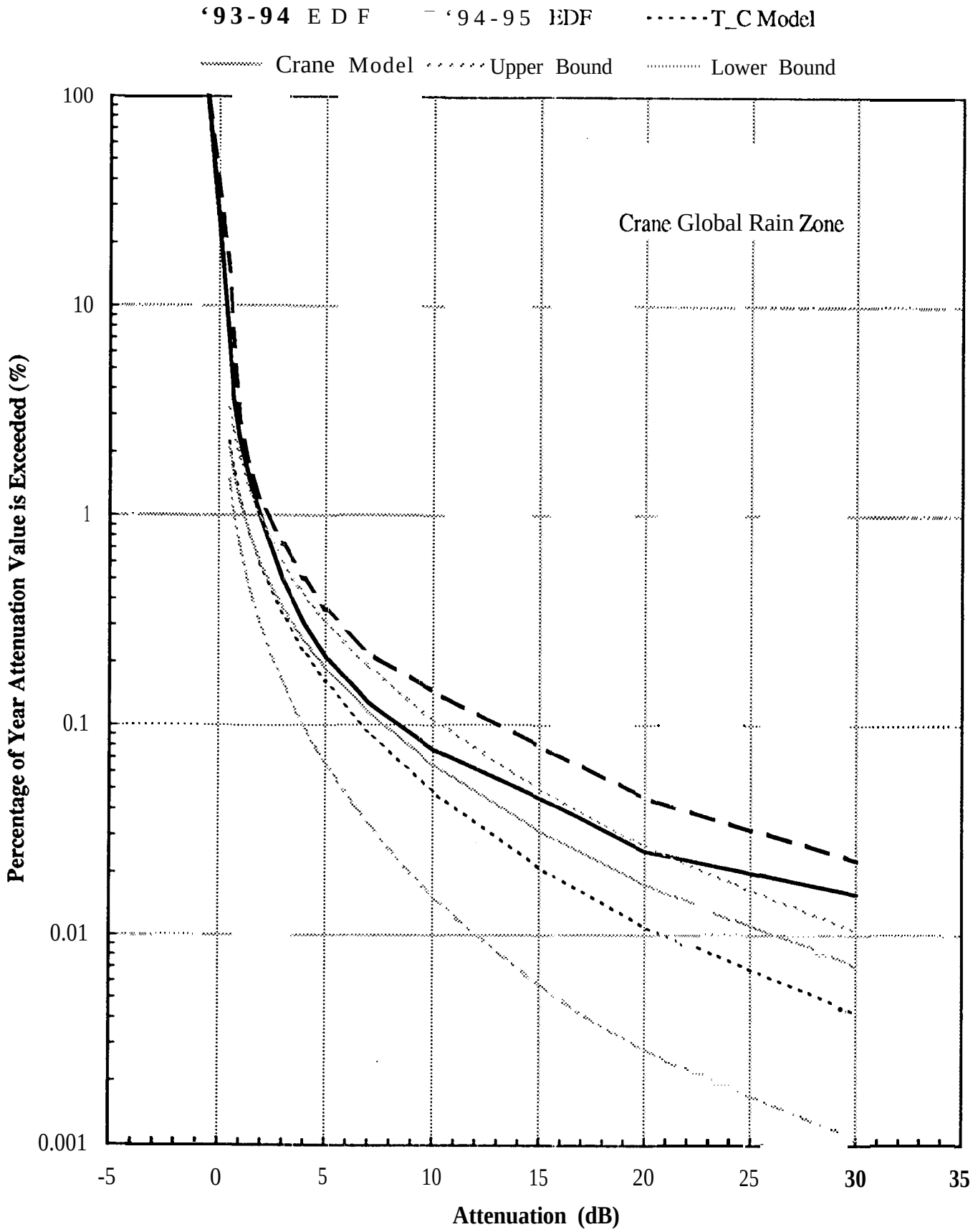
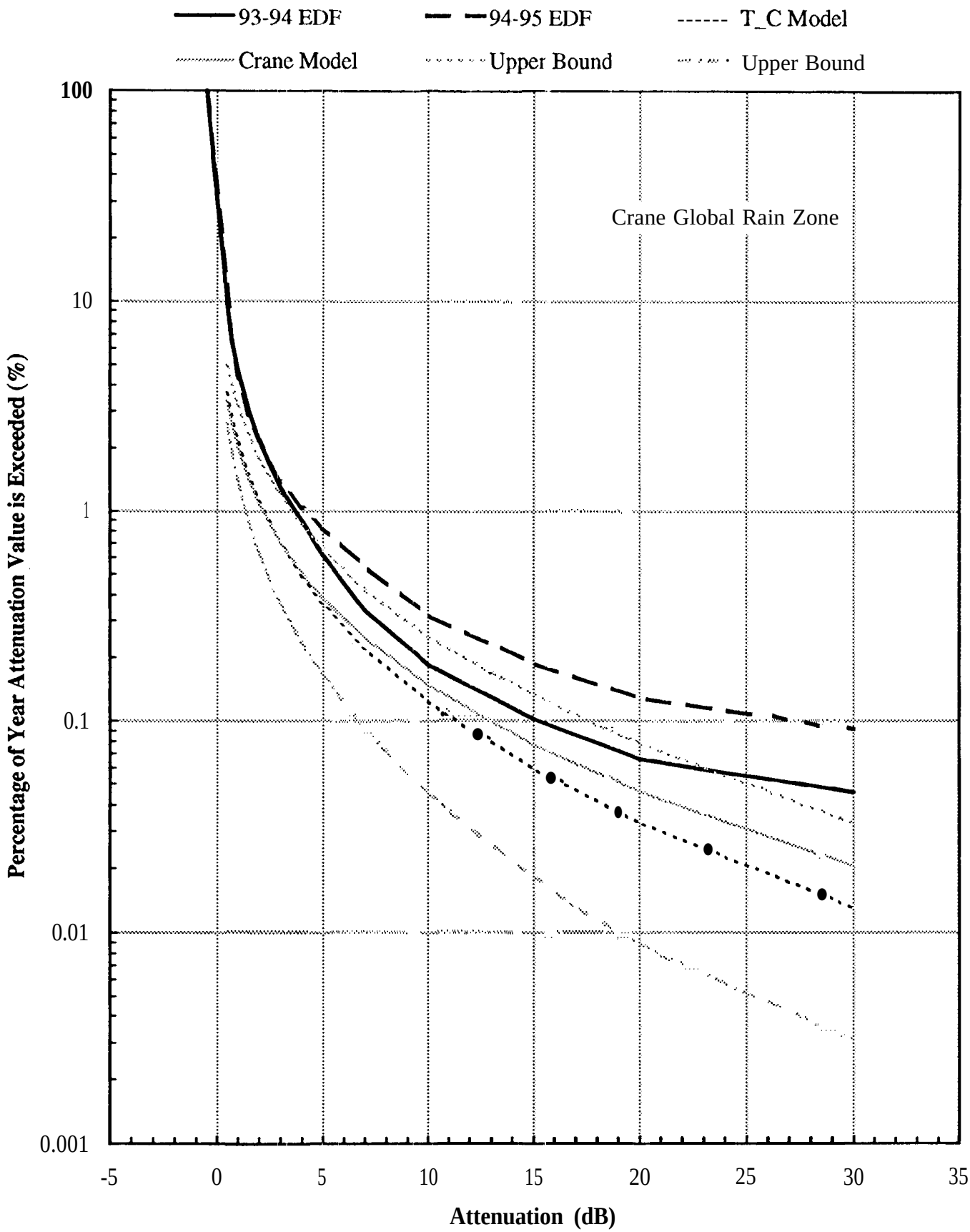
ACTS PROPAGATION EXPERIMENT, NORMAN, OKLAHOMA

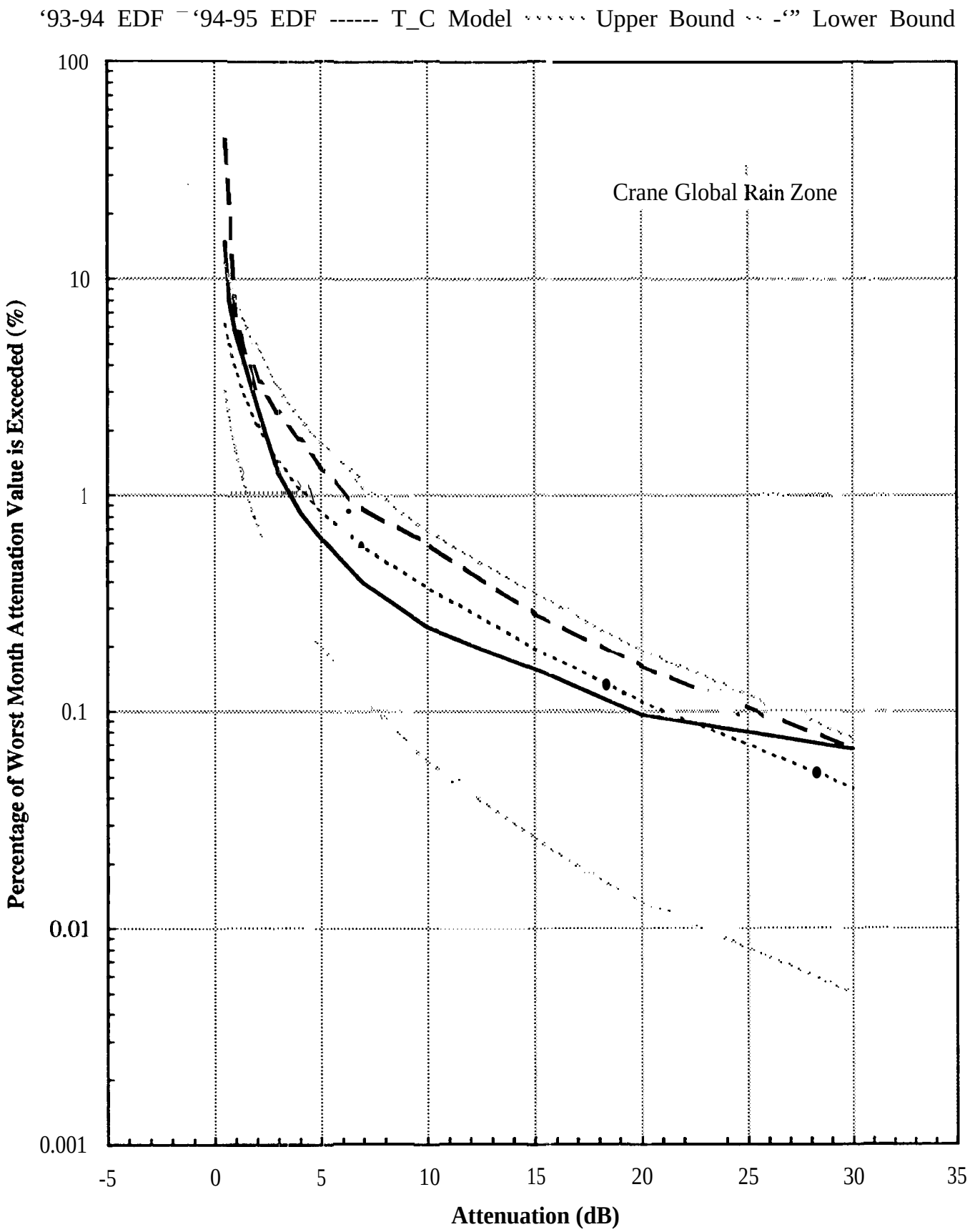
F. Shimabukuro **(Aerospace)**

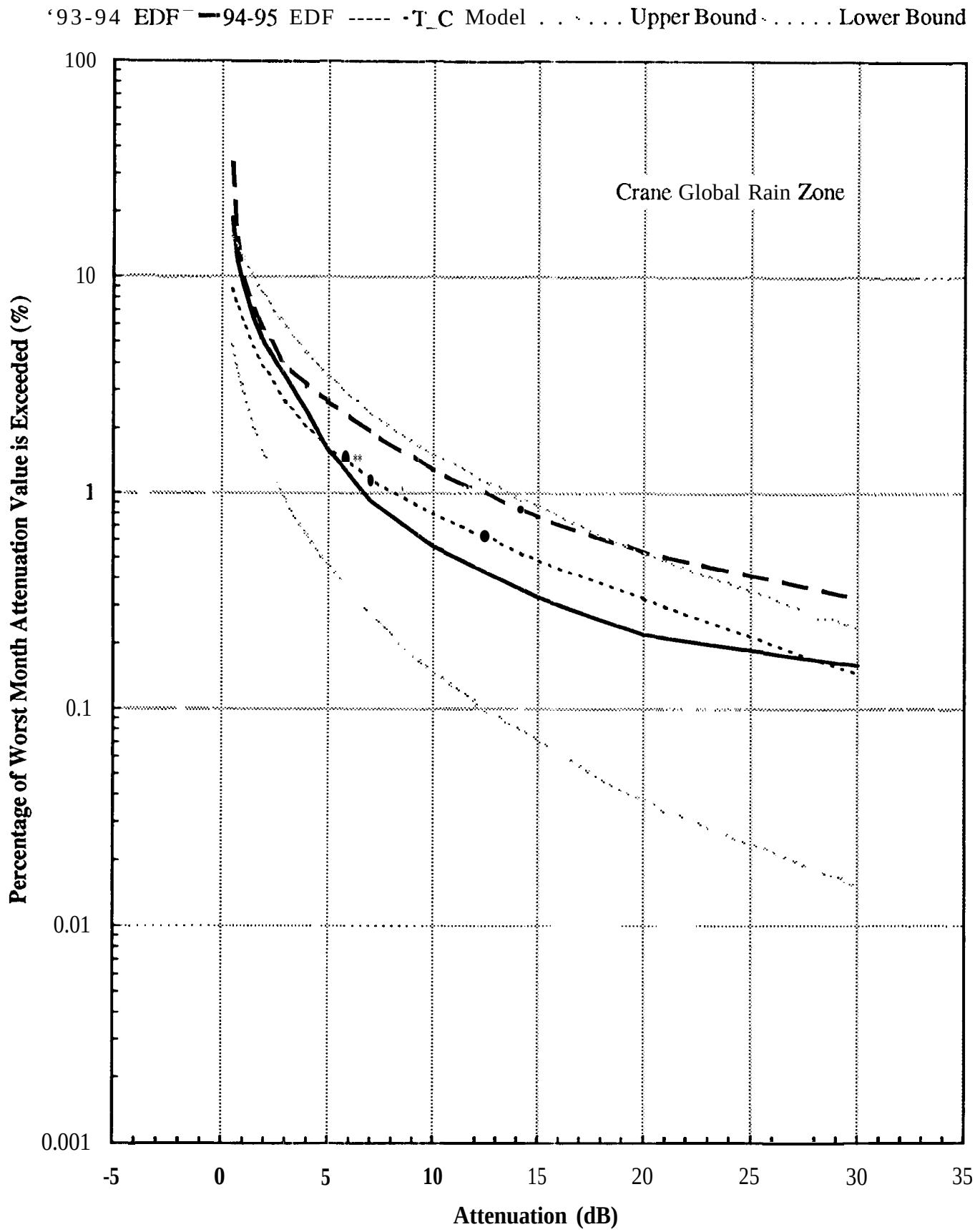

5 dB @ 20 GHz 93-94
5 dB @ 20 GHz 94-95
5 dB @ 27 GHz 93-94
5 dB @ 27 GHz 94-95
Minutes per Month 5 dB Attenuation Exceeded
350
300
250
200
50
00
50
0
Winter
Spring
Summer
Fall

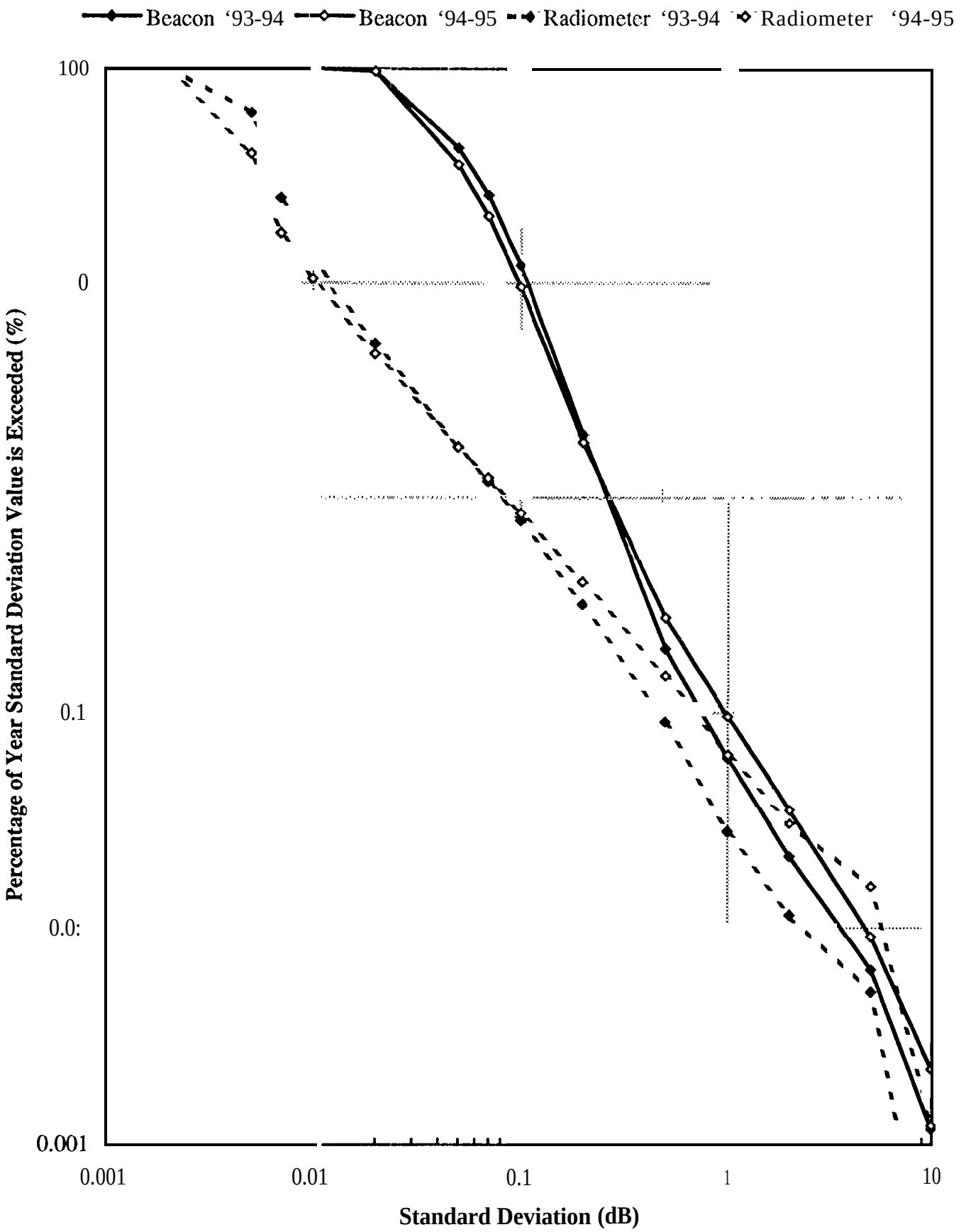

'93-94 EDF
'94-95 EDF
T_C Model
Crane Model
Upper Bound
Lower Bound
ITU-R Rain Zone
100
10
1
0.1
0.01
0.001
Percentage of Year Attenuation Value is Exceeded (%)
-5
0
5
10
15
20
25
30
35
Attenuation (dB)

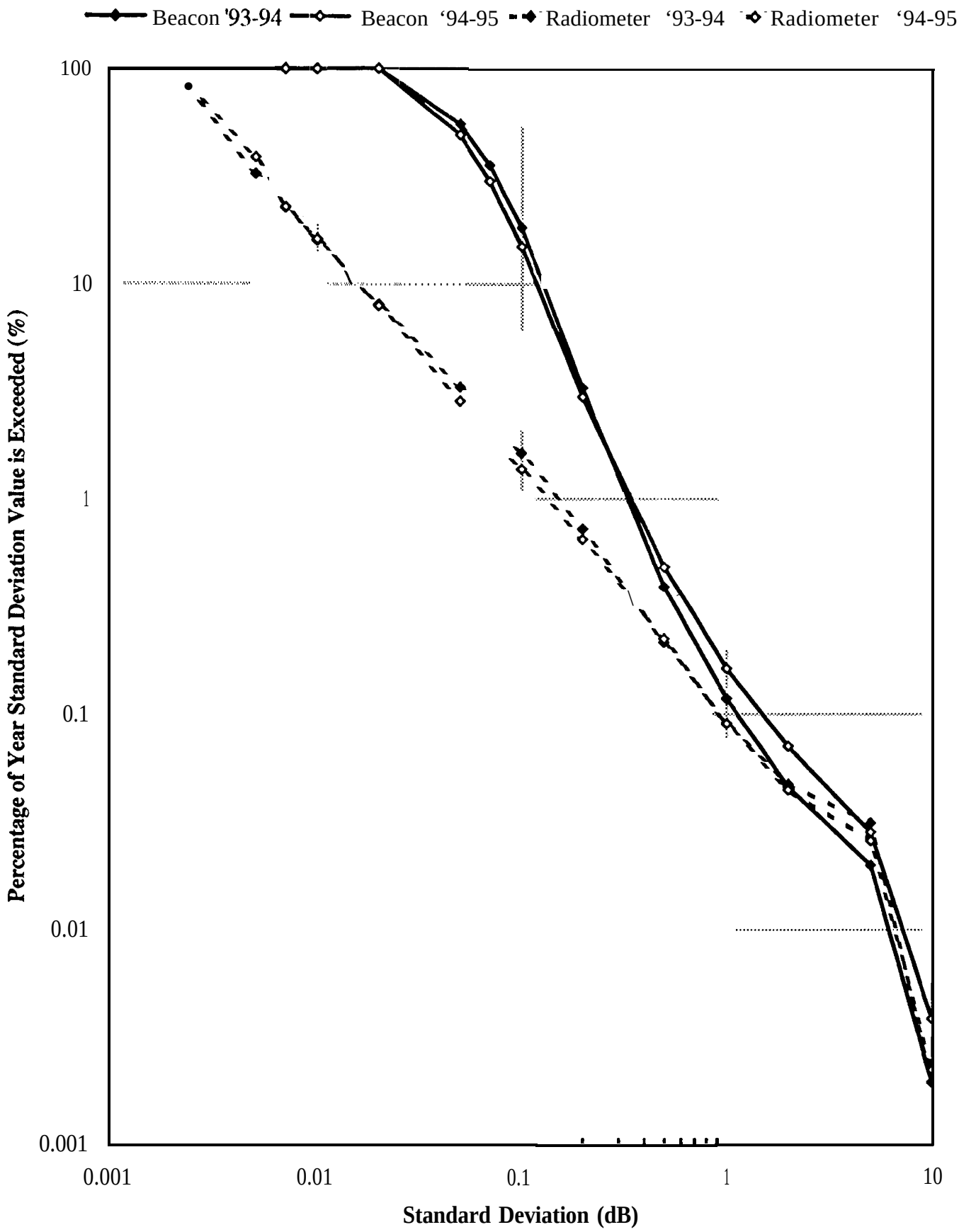

'93-94 EDF
'94-95 EDF
T_C Model
Crane Model
Upper Bound
Lower Bound
Crane Global Rain Zone
100
10
1
0.1
0.01
0.001
Percentage of Year Attenuation Value is Exceeded (%)
-5
0
5
10
15
20
25
30
35
Attenuation (dB)

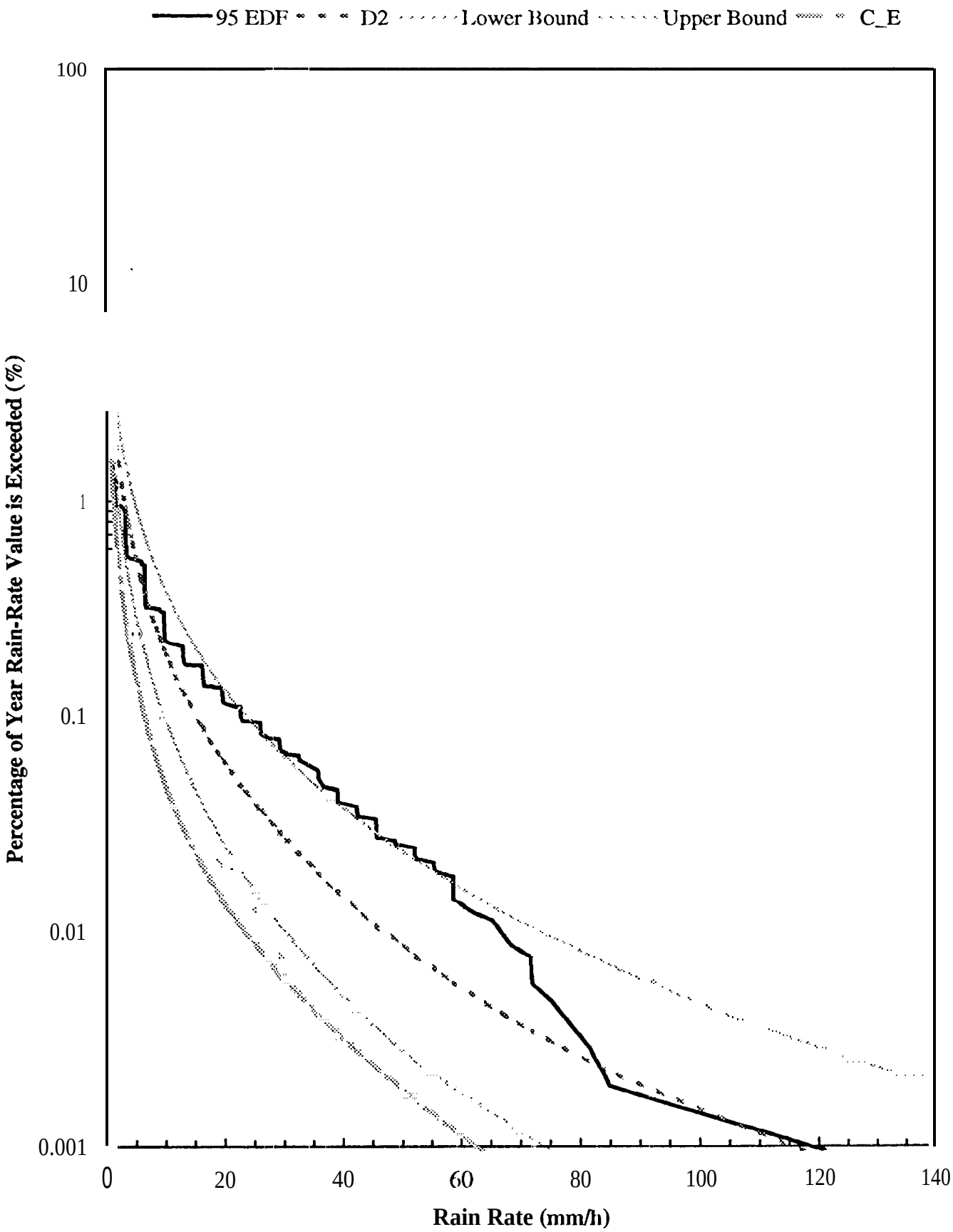

93-94 EDF
94-95 EDF
T_C Model
Crane Model
Upper Bound
Upper Bound
Crane Global Rain Zone
100
10
1
0.1
0.01
0.001
Percentage of Year Attenuation Value is Exceeded (%)
-5
0
5
10
15
20
25
30
35
Attenuation (dB)


'93-94 EDF
'94-95 EDF
T_C Model
Upper Bound
Lower Bound
Crane Global Rain Zone
Percentage of Worst Month Attenuation Value is Exceeded (%)
100
10
1
0.1
0.01
0.001
-5
0
5
10
15
20
25
30
35
Attenuation (dB)


'93-94 EDF
94-95 EDF
T_C Model
Upper Bound
Lower Bound
Crane Global Rain Zone
Percentage of Worst Month Attenuation Value is Exceeded (%)
100
10
1
0.1
0.01
0.001
-5
0
5
10
15
20
25
30
35
Attenuation (dB)


Beacon '93-94
Beacon '94-95
Radiometer '93-94
Radiometer '94-95
100
0
0.1
0.0:
0.001
Percentage of Year Standard Deviation Value is Exceeded (%)
0.001
0.01
0.1
1
10
Standard Deviation (dB)


Beacon '93-94
Beacon '94-95
Radiometer '93-94
Radiometer '94-95
100
10
1
0.1
0.01
0.001
Percentage of Year Standard Deviation Value is Exceeded (%)
0.001
0.01
0.1
1
10
Standard Deviation (dB)


95 EDF
D2
Lower Bound
Upper Bound
C_E
100
10
1
0.1
0.01
0.001
Percentage of Year Rain-Rate Value is Exceeded (%)
0
20
40
60
80
100
120
140
Rain Rate (mm/h)

ACTS Propagation Experiment
Norman, Oklahoma

Block 5 Minute Distributions - Attenuation Relative to Clear Sky
ACTS: Ok Total Time Lost Time 20 GHz Beacon Attenuation Relative to Clear Sky Histogram - Minutes above threshold

Year	M	Minutes	Minutes	-0.5	0.5	0.7	1	1.5	2	3	4	5	7	10	15	20	30	Bad
				Attenuation (dB) =>														
93	12	44624.5	1926.92	39493	406	366	649	226	190	105	47	51	14	6				1036
94	1	44	4 (W	5.38333	43091	364	267	139	15	4								739
94	2	40320	18.8333	35947	1091	584	409	192	211	70	18	18	19	7	2	1	4	1353
94	3	44640	6.75	40360	857	1119	776	358	301	189	69	9	3	1	1	1	1	558
94	4	43200	102.217	38201	1013	500	314	227	302	132	44	28	26	9	2	1	1	1965
94	5	44640	15.5167	41502	915	928	422	160	205	60	21	27	15	22	18	11	6	302
94	6	43200	1.35	39487	2955	299	133	71	82	29	13	14	10	6	4	5	20	69
94	7	44640	25.0167	40705	2288	357	242	135	155	115	96	108	52	40	27	13	30	161
94	8	44200		41008	2338	334	178	45	51	37	24	25	8	10	25	6	18	93
94	9	43200	67.5667	39339	1349	465	316	168	165	86	71	72	67	26	11	5		985
94	10	43790.933	245.317	38555	1527	695	475	172	75	18	13	19	13	16	1	4	1	1941
94	11	43200	365.883	38079	1958	703	448	540	606	160	61	64	34	19	10	2		144
94	12	44640	33.6833	39072	1734	817	414	103	75	33	14	29	7	4	1			2301
95	1	44640	100.683	39516	822	324	168	94	81	53	36	26	14	2	1	1	2	3386
95	2	40320	141.133	37564	332	412	138	77	24	10	10	2						1598
95	3	44640		37684	3334	1701	1085	315	210	69	31	24	21	9	3			138
95	4	43200	39.25	39847	840	807	594	243	211	95	54	46	30	30	18	5	11	328
95	5	44640	259.317	34312	4974	914	648	402	432	267	206	218	125	143	55	42	30	1591
95	6	43200	27.35	23459	716	580	432	242	326	126	66	70	57	54	29	18	25	16966
95	7	44640	2.1 1667	27180	7172	4852	297	39	96	119	113	34	25	17	16	6	15	4745
95	8	44640	22.2667	27251	9628	6669	645	129	108	54	35	18	25	19	8	8	5	12
95	9	43200	6.78333	29868	6976	3671	1009	453	382	219	150	171	61	32	27	21	23	128
95	10	44640	6.75	42299	1647	255	124	74	51	27	2	7	8	7	11	9	1	89
95	11	43150.917	1456.35	39952	158	123	157	82	60	38	22	6	7					589
93-94	An	524295.43	2780.75	475767	17061	6617	4501	2309	2347	1001	477	435	261	162	101	49	81	9346
94-95	An	525550.92	2095.68	418004	38333	21125	5621	2253	2056	1110	739	651	380	317	169	110	112	31871
93-94	Ordered			511169	35402	18341	11724	7223	4914	2567	1566	1089	654	393	231	130	81	
94-95	Ordered			490980	72976	34643	13518	7897	5644	3588	2478	1739	1088	708	391	222	112	
93-94	edf (%)			99.805	6.9122	3.581	2.2891	1.4103	0.9594	0.5012	0.306	0.213	0.128	0.077	0.045	0.025	0.016	
94-95	edf (%)			99.877	14.845	7.0472	2.7499	1.6064	1.1481	0.7299	0.504	0.354	0.221	0.144	0.08	0.045	0.023	

ACTS Propagation Experiment
Norman, Oklahoma

Block 5 Minute Distributions - Attenuation Relative to Clear Sky
ACTS Ok Total Time Lost Time 27 GHz Beacon Attenuation Relative to Clear Sky Histogram - Minutes above threshold

				Attenuation (dB) =>														
Year	M	Minutes	Minutes	-0.5	0.5	0.7	1	1.5	2	3	4	5	7	10	15	20	30	Bad
93	12	44624.5	1926.92	37916	721	526	682	517	648	218	111	128	96	27	8	2		1036
94	1	44640	5.38333	39981	1236	916	1067	465	212	10	2	2						739
94	2	40320	18.8333	35441	893	521	364	345	367	176	133	111	33	15	12	6	7	1353
94	3	44640	6.75	39703	642	754	1017	575	520	221	196	218	35	3	1	1	8	558
94	4	43200	102.217	37077	1261	730	573	365	364	231	162	206	84	28	18	4	3	1965
94	5	44640	15.5167	40337	623	841	908	465	639	127	141	99	47	28	8	20	31	302
94	6	432(K!	1.35	41289	852	304	302	85	76	60	44		46	15	19	5	3	28	69
94	7	44640	25.0167	40909	1290	628	441	193	223	116	87	132	161	106	44	28	71	161
94	8	44200		39214	2983	853	468	163	172	46	31	44	38	32	6	7	50	93
94	9	43200	67.5667	37315	1821	843	692	409	295	178	107	119	111	95	47	15	19	985
94	10	43790.933	245.317	34988	2563	1192	1233	658	583	200	65	40	22	20	15	6	6	1941
94	11	43200	365.883	36539	1968	1263	726	322	441	480	365	296	136	58	21	13	12	144
94	12	44640	33.6833	37298	1714	1381	969	381	192	69	39	42	24	25	4	2	1	2301
95	1	44640	100.683	38098	880	936	622	138	151	95	34	65	80	20	12	4	5	3386
95	2	40320	141.133	36885	661	255	345	101	90	34	32	22	11	4				1598
95	3	44640		38401	1686	1316	1132	684	778	221	97	80	45	28	13	9		138
95	4	43200	39.25	38340	863	876	955	620	454	197	111	124	74	54	20	22	37	328
95	5	44640	259.317	36993	1531	840	756	375	558	316	217	323	301	226	108	93	144	1591
95	6	43200	27.35	22991	580	494	613	291	338	198	169	194	97	72	44	22	97	16966
95	7	44640	2.11667	33775	4602	769	187	49	50	26	47	144	149	32	13	10	38	4745
95	8	44640	22.2667	34637	8098	844	328	139	185	103	58	78	56	17	22	7	30	12
95	9	43200	6.78333	31268	5601	2473	1161	536	727	331	192	238	250	150	48	10	78	128
95	10	44640	6.75	42750	700	417	328	62	129	41	21	34	7	13	3	3	22	89
95	11	43150.917	1456.35	34682	445	285	212	136	172	75	22	38	41	8	5			589
93-94	An	524295.43	2780.75	460709	16853	9371	8473	4562	4540	2063	1444	1441	778	431	185	105	235	9346
94-95	An	525550.92	2095.68	426118	27361	10886	7608	3512	3824	1706	1039	1382	1135	649	292	182	452	31871
93-94	Ordered			511190	50481	33628	24257	15784	11222	6682	4619	3175	1734	956	525	340	235	
94-95	Ordered			486146	60028	32667	21781	14173	10661	6837	5131	4092	2710	1575	926	634	452	
93-94	edf (%)			99.809	9.8563	6.566	4.7361	3.0818	2.191	1.305	0.902	0.62	0.339	0.187	0.103	0.066	0.046	
94-95	edf (%)			98.894	12.211	6.645	4.4308	2.8831	2.169	1.391	1.044	0.832	0.551	0.32	0.188	0.129	0.092	